Fishes from the Cocos-Keeling Islands

By N. B. Marshall, M.A.
Department of Zoology, British Museum (Nat. Hist.)

Plates Nos. 18 and 19, between pages 198 and 199.

This report concerns the collection of fishes made by Dr. C. A. Gibson-Hill while stationed on these islands from January to November in 1941. The collection consists of 189 species, one of these being a new species of *Scorpaenodes,* while 119 are new records for the Cocos-Keeling Islands.

Previous systematic work on the fish fauna was carried out by Jenyns (Zoology of the Voyage of the "Beagle" 1842) but principally by Bleeker (various papers in *Natuurkundig Tijdschrift voor Nederlandsch Indië* from 1854 to 1859). Reference to these two workers will be found under the appropriate species, while new records have been emphasised by an asterisk preceding the scientific name. The local Malay name has also been included whenever this was given by Dr. Gibson-Hill in his field notes.*

It will be seen that the fish fauna of these islands was not well known, this collection providing a welcome addition to our knowledge. Furthermore, for most of the species collected, Dr. Gibson-Hill was able to make notes on colour and ecology. Colour notes have been included where they contain new information. Those on the ecology of the various reef fishes have been invariably introduced, since they nearly always provide precise information on this interesting, but little known, aspect of tropical marine biology.

Order ISOSPONDYLI

Family ALBULIDAE

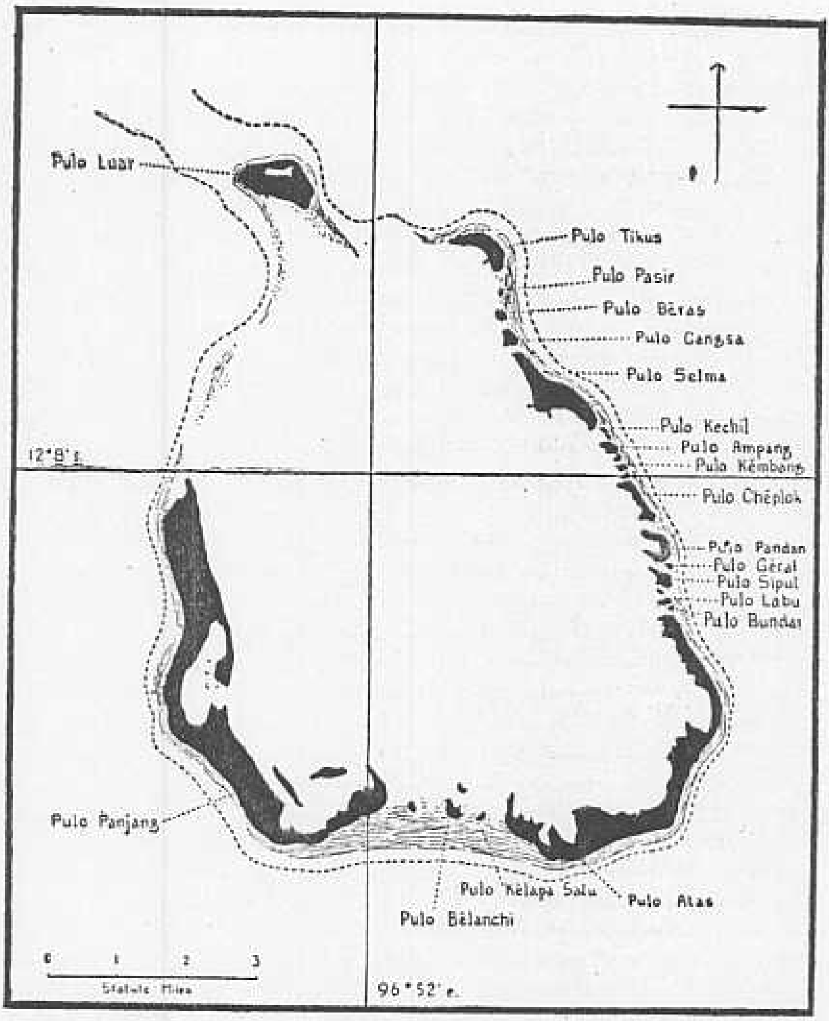
***Albula vulpes** (Linneaus). (Ikan) Bandang.

Four specimens from 155–175 mm.[1] "Common in large shoals in the weedy, shallow, sandy-bottomed water at the south end of the main lagoon, and in the smaller lagoons on Pulo Panjang and North Keeling".

---

* The inhabitants of the Cocos-Keeling Islands are descended largely from Malays from Java and Sumatra, and their language is much nearer to the Malay of Batavia and the western Java ports than it is to the "pure" Malay of Johore. The fish names used here are spelt as nearly as possible in accordance with local pronunciation, using the same system of phonetics as that followed by R. J. Wilkinson (*A Malay-English Dictionary* (Romanised), Mytilene, 1932).

[1] In all instances these measurements are of the standard length, that is from the lip of the snout to the caudal flexture.



Sketch map of the main atoll, usually known as Cocos, in the Cocos-Keeling Islands, drawn partly after Wood-Jones (1912: 138). The uneven wavy lines represent areas of the reef which are dry or largely dry at low tide.

Family CLUPEIDAE

***Spratelloides delicatulus** (Bennett). Ikan Tĕri.

Twenty-two specimens from 28–37 mm. "Occurring in large shoals in clear, sandy-bottomed water of a depth of about a fathom".

***Thrissocles baelama** (Forskal).

One specimen of 85 mm.

Family CHANIDAE

***Chanos chanos** (Forskal). (Ikan) Bandang Laut.

Four specimens from 90–225 mm. "This species is similar in habits to *Albula vulpes*, except that it is not so common in the smaller lagoons".

Order INIOMI

Family SYNODONTIDAE

***Saurida gracilis** (Quoy & Gaimard).

One specimen of 125 mm.

Other species recorded,

Synodus variegatus (Lacépède).

Saurus synodus Bleeker, Nat. Tijdschr. Ned. Ind. VII, 1854, p. 38.

Order APODES

Family MURAENIDAE

Echidna polyzona (Richardson).

Muraena polyzona, Bleeker, Nat. Tijdschr. Ned. Ind. XVI, 1858–59, p. 205.

One specimen of 88 mm.

Echidna nebulosa (Ahl). Lendong Bureh.

Muraena variegata Bleeker, Nat. Tijdschr. Ned. Ind. XVI, 1858–59, p. 205.

One specimen of 410 mm. "This species is fairly common in the coral masses in shallower water, of a depth of less than two fathoms, inside the lagoon".

Gymnothorax meleagris (Shaw).

Muraena buroënsis Bleeker, Nat. Tijdschr. Ned. Ind. XVI, 1858–59, p. 205.

One specimen of 190 mm.

***Gymnothorax petelli** (Bleeker).

One specimen of 217 mm.

***Gymnothorax flavimarginatus** (Rüppell). Lendong (Bĕtul).

Six specimens from 109–610 mm. "These fish are found among the coral boulders on the barrier, mostly at the south end of the lagoon. They reach a length of about two and a half feet, and are considered very dangerous by the Malays. Larger specimens, up to four feet, may occasionally be found lurking in hollows in the great masses of coral rising in deeper water in the centre of the lagoon". The immature stages of this species are called *Lendong Pasir* by the Malays. They occur "abundantly among weeds in the sandy, shallow water at the south end of the lagoon".

Gymnothorax favaginea (Bloch, Schneider). Lendong Bĕlang.

Muraena tessellata Bleeker, Nat. Tijdschr. Ned. Ind. XVI, 1858–59, p. 205.

Three specimens from 200–360 mm. "This species is found principally in the coral masses lying in water of medium depth, two to four fathoms, inside the lagoon".

Other species recorded,

1. **Muraena pardalis** Schlegel.
   Muraena pardalis Bleeker, Nat. Tijdschr. Ned. Ind. XVI, 1858–59, p. 205.
2. **Gymnothorax thrysoideus** (Richardson).
   Muraena prosopeion Bleeker, *Ibid.*
3. **Gymnothorax rüppelli** (McClelland).
   Muraena colubrina Bleeker, *Ibid,* VIII, 1855, p. 446.
4. **Gymnothorax undulata** (Lacépède).
   Muraena cancellata Bleeker, *Ibid* VII, 1854, p. 38.
5. **Gymnomuraena marmorata** Lacépède.
   Muraenoblenna tigrina, Bleeker, *Ibid* XVI, 1858–59, p. 205.

Family ECHELIDAE

***Muraenichthys macropterus** Bleeker.

Two specimens of 118 and 151 mm.

***Muraenichthys gymnotus** Bleeker. Moa.

One specimen of 247 mm. "This eel is found in the shallow, muddy sandy water round the edge of the lagoon in the neighbourhood of Pulo Selma and Pulo Panjang".

Family OPHICHTHYIDAE

Leiuranus semicinctus (Lay & Bennett). Ular Tanah.

Leiuranus lacépèdii, Bleeker, Nat. Tijdschr. Ned. Ind. XVI, 1858–9, p. 205.

Five specimens from 180–230 mm. "This species occurs in shallow, sandy water along the inner edges of the lagoon. It is said to have a dangerous bite, and is much feared by the Malays. Full grown specimens, with a length of about two feet, are rare".

Order SYNENTOGNATHI

Family BELONIDAE

***Belone platyura** Bennett. Ikan Duwong (Duwong) Sena.

Three specimens from 335 to 350 mm. "This species occurs in the surface water of the shallower, sandy areas at the south end of the lagoon".

Other species recorded,

Strongylura annulatus (Cuvier & Valenciennes).

Belone gigantea, Bleeker, Nat. Tijdschr. Ned. Ind. XX, 1859–60, p. 142.

Family HEMIRHAMPHIDAE

***Hemirhamphus balinensis** Bleeker. Ikan Duwong Duwong.

Two specimens of 270 and 200 mm. "Occur in the surface water all over the lagoon, irrespective of its depth, in fair numbers.

Other species recorded,

Hemirhamphus dussumierii (Cuvier & Valenciennes).

Hemirhamphus dussumierii, Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 446.

Family EXOCOETIDAE

***Cypsilurus atrisignis** Jenkins. Ikan Tĕrbang Jantan.

One specimen of 300 mm. The habits of this fish are similar to those of *Cypsilurus cyanopterus*, but it is much less common.

***Cypsilurus cyanopterus** (Cuvier & Valenciennes).
Ikan Tĕrbang (Bĕtina).

Two specimens of 28·7 and 28·9 mm. "This species is very common in the open sea outside the lagoon, and in the short channel between Pulo Tikus and Pulo Luar. It does not occur inside the lagoon".

Bruun (1935) concludes that "statements of the occurrence of *C. cyanopterus* in the Indo-Pacific region must be treated with caution". Weber and de Beaufort (1922) list *C. bahiensis* (Ranzani)* from there with which they synonymize *Exocoetus spilonotopterus* Bleeker, but Bruun has suggested that Bleeker was probably right in making the latter an independent species.

Measurements and counts of the two Cocos-Keeling specimens and of other Indo-Pacific material were carried out in the way outlined by Bruun for comparison with his Atlantic findings. The results, which are set out in the accompanying table show that there is little significant difference between the two groups although it may well be that, given a good series of specimens, differences of a subspecific level would be found.

	Indo-Pacific specimens	*Atlantic specimens*
Dorsal rays	12 – 13	13 – 14 (i)
Anal rays	9 – 11	9 – 11
Pectoral rays	12 – 14 (ii)	13 – 15
Gill rakers	23 – 28	22 – 25
Predorsal scales	36 – 43	35 – 40
Transverse scales	7½ – 8½	7¼ – 8½
Standard length	240 – 310 mm..	142·4 – 291·0 mm.
% of S.L.		
Predorsal length	72 – 75·1	69·1 – 72·2
Preventral length	56·4 – 66·7	58·3 – 61·6
Preanal length	78 – 85	75·6 – 80·4
Length of head	20·5 – 25·3	22·9 – 24·6
Length of snout	5·2 – 7·5	4·6 – 6·2
Diameter of eye	6·2 – 7·9	6·5 – 8·0
Interorbital breadth	7·5 – 9·0	7·7 – 8·6
Length of pectoral	66·8 – 72·0	63·9 – 71·8
Length of ventral	24·2 – 32·2	26·3 – 35·2
Height of dorsal	10·4 – 13·7	10·4 – 19·4
Height of body	15·3 – 20·0	15·5 – 18·8
Breadth of body	13 – 15·2	12·6 – 14·8

(i) Specimens with 12 rays in the dorsal are known from the museum collections.

(ii) One specimen had 14 pectoral rays on the right side and 15 on the left.

The Atlantic data was taken from Bruun (1935 p. 41); that from the Indo-Pacific is based on the following:—

> *Exocoetus spilonotopterus*, Sumatra, Bleeker (labelled type but probably a paratype), specimens from Natal (i) Misol Island (i) and Cocos-Keeling Islands (ii) (all labelled *Exocoetus spilonotopterus*).

---

* Bruun has clearly shown that *Exocoetus bahiensis* Ranzani has been wrongly applied by Günther and subsequent workers to *Exocoetus cyanopterus* c.v.

In addition to the above data, measurements of the 100 mm. intermaxillary tooth index on Bleeker's specimen gave an average value of 0·21 which agrees well with the values of 0·23, 0·21 and 0·17 given by Bruun.

Order SOLENICHTHYES

Family FISTULARIIDAE

*__Fistularia petimba__ Lacépède. Ikan Tĕrompet.

Two specimens of 750 and 800 mm. "They usually swim singly or in pairs and are found along the outer edge of the barrier".

Family SYNGNATHIDAE

*__Choerichthys sculptus__ (Günther).

One specimen of 54 mm.

*__Hippocampus trimaculatus__ Leach.

One specimen of 120 mm. " . . . . taken in a pool on the outer edge of the reef, at the north-east angle of Pulo Tikus. This cannot be its normal habitat as these pool; are examined fairly frequently for fish and crayfish; and all the Malays to whom this specimen was shown were certain that they had never seen one like it before".

Other species recorded,

1. **Aulostomus valentini** (Bleeker).
   Polypterichthys valentini, Bleeker, Nat. Tijdschr. Ned. Ind. XX, 1859–60, p. 202.
2. **Doryrhamphus melanopleura** (Bleeker).
   Syngnathus melanopleura, Bleeker, Nat. Tijdschr. Ned. Ind. XV, 1858, p. 464.
3. **Micrognathus brevirostris** (Rüppell).
   Syngnathus Andersonii, Bleeker, Nat. Tijdschr. Ned. Ind. XV, 1858, p. 465.
   Syngnathus tetrophthalmus, Bleeker, *Ibid*, p. 467.

Order BERYCOMORPHI

Family HOLOCENTRIDAE

Holocentrum sammara (Forskal). (Ikan) Wak Malam.

Holocentrum sammara Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 445.

Five specimens from 57 to 143 mm. "The younger fish of this species are found in small shoals in the shallow, coral-strewn water inside the barrier. The older fish occur in deeper water inside the lagoon, in the vicinity of the large masses of coral-rock".

Holocentrum laeve Günther.

Three specimens from 125 to 132 mm.

Weber and de Beaufort (1929) have synonymized this species under *H. sammara,* pointing out that the only constant differences between them (which are not sexual) consist in the absence in *H. laeve* of the black blotch on the anterior part of the spinous dorsal and the slightly longer snout in *H. sammara.* While it is unsafe (without good field evidence) to call two groups of fishes, which only differ in colour, separate species, there is a constant structural difference between these two species. This is in the cheek scaling, there being 4 rows of scales (crossing the line from eye to preopercular angle) in *H. laeve* while there are 5 in *H. sammara.* There is also a difference in the number of scales in each row. Starting with the row nearest the eye we may write cheek scale formalae as follows:—

> *Holocentrum sammara*—7 (8), 7 (8), 6–7, 5–7, 2–5. Based on 20 specimens ranging in length from 34 to 184 mm. and in distribution from various localities in the Indian Ocean to Micronesia.
>
> *Holocentrum laeve*—6, 6, 6–7, 4–5. Based on the type specimen from Amboyna and 6 specimens from the Cocos-Keeling Islands, the Seychelles, Java, Mortlock Islands and Samoa.

***Holocentrum lacteoguttatum** (Cuvier & Valenciennes).

One specimen of 52 mm.

Holocentrum diadema Lacépède. (Ikan) Wak Malam Merah.

Holocentrum diadema Bleeker, Nat. Tijdschr. Ned. Ind. XX, 1859–60, p. 142.

Three specimens from 90–110 mm. "Found in small shoals in the upper portions of the great masses of stag-horn coral which are growing up over portions of the lagoon".

Holocentrum spiniferum (Forskal). Wak Malam Bĕsar.

Holocentrum leo Bleeker, Nat. Tijdschr. Ned. Ind. VII, 1854, p. 354.

One specimen.

Myripristis murdjan (Forskal). Ikan Mĕgintib.

Myripristis murdjan Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 445.

Two specimens of 150 and 155 mm. "This species occurs in small shoals in the upper strata of the great masses of coral growing up, towards the edge of the lagoon, in the neighbourhood of Pulo Selma".

Order PERCOMORPHI

Suborder Percoidea
(Division Perciformes)

Family SERRANIDAE

***Epinephelus corallicola** (Cuvier & Valenciennes).
Gĕrapu Bĕlang.

Two specimens of 230 and 300 mm. "This species ranges up to some 340 mm. in length. It occurs in shallow, coral strewn water, at a depth of two fathoms or less, inside the lagoon".

***Epinephelus tauvina** (Forskal).

Ten specimens from 85–185 mm.

Epinephelus merra Bloch.

Serranus hexagonatus, Bleeker, Nat. Tijdschr. Ned. Ind. VII, 1854, p. 38.

Four specimens from 45–80 mm.

Epinephelus urodelus (Cuvier & Valenciennes).
Gĕrapu Merah Tua.

Serranus urodelus, Bleeker, Nat. Tijdschr. Ned. Ind. VII, 1854, p. 38.

Seven specimens from 85–195 mm. "These fish are common in the rock and coral patches inside the lagoon, and over the seaward edge of the reef outside, where the water has a depth of more than four to six fathoms".

***Epinephelus dämelii** (Günther). Gĕrapu Kolam.

One specimen of 250 mm. "Not much seems to be known about this fish and I have only seen this one specimen which was taken from a coral boulder in a shallow barrier pool, off the north end of Pulo Panjang".

***Epinephelus boenack** (Bloch).

One specimen of 95 mm.

***Plectropoma maculatum** (Bloch). Gĕrapu Bintang.

Two specimens of 270 and 280 mm. "Gĕrapu Bintang occur inside the lagoon in the rock and coral patches where the water has a depth of four to eight fathoms".

***Anyperodon leucogrammicus** (Cuvier & Valenciennes).

Two specimens of 210 and 225 mm. "These are two specimens taken in a trap at a depth of three fathoms near a patch of coral, in the north-east corner of the lagoon".

***Grammistes sexlineatus** (Thunberg).

One specimen of 60 mm. "Taken in a rock pool near Pulo Ampang Bĕsar".

***Pseudogramma polyacanthus** Bleeker.

One specimen of 35 mm. "This fish is grey brown, the centre of each flank scale being darker than its edge, with a series of pale hazy spots over the flank, pin-point black dots on the cheek and a single, large black spot on the operculum".

***Aporops bilinearis** Schultz.

One specimen of 58 mm.

Family PLESIOPIDAE

Plesiops nigricans (Rüppell). Ikan Japu.

Plesiops caeruleolineatus, Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 169.

Four specimens from 39 to 110 mm. "This is a most attractive little fish. The flanks are dark brown and the head a deep blue black, all the flank scales having a vertical slot of bright peacock blue and the head being covered with a muddled arrangement of spots of the same colour. On the operculum is a single large, bright ultramarine spot, surrounded by a narrow brown band bordered by a thin light blue line. The fins are a very dark blue, almost black, with rows of bright light blue specks. The free edge of the pectoral fin is a rich chrome yellow".

"*Ikan Japu* are common among the coral in the pools between the tide marks, but may also occasionally be taken in more weedy water inside the lagoon".

***Plesiops melas** Bleeker.

Fourteen specimens from 23 to 45 mm. "This little fish is uniform dark grey, almost black, with a thin, bright blue line below the chin and another along the dorsal fin near its base. The tips of the dorsal spines are red. The iris is also red, with a bright blue horseshoe curving posteriorly along its outer edge".

"This species which is fairly common, is found under coral and coral rock in the barrier pools".

Family CARANGIDAE

***Scomberoides tolooparah** (Rüppell). Ikan Talong Talong.

Two specimens of 67 and 86 mm. "These fish are an almost uniform silver-white. *Talong talong* generally occurs singly or in pairs in sandy bottomed water, of a depth of two fathoms or more, in the centre of the lagoon".

***Caranx melampygus** Cuvier & Valenciennes. (Ikan) Sambak.

Two specimens of 80 and 190 mm. "*Sambak* usually occur in small shoals. The younger fish are generally found among the shallow, coral-strewn pools over the inner border of the reef along the seaward side of the islands, and especially the corresponding areas on the barrier. The older fish frequent slightly deeper water, mostly inside the lagoon, down to about two fathoms".

***Caranx ferdau** (Forskal).

Three specimens from 125 to 330 mm.

Trachinotus blochi (Lacépède). Bawal.

Trachinotus mookalee Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 169.

Six specimens from 70 to 230 mm. "This fish is silvery-white, rising to very pale grey on the dorsal surface. The four elongated rays of the dorsal fin are smoky-grey and of the anal smoky-grey in front and orange-yellow behind. The pelvic fins are orange-yellow".

"*Bawal* occurs inside the lagoon only, and swims in shoals. Small fish are found in shallow, sandy, weedy water. Larger specimens are mostly in deeper, sandy-bottomed water".

***Trachinotus bailloni** Lacépède.

One specimen of 82 mm.

Other records,

Elagatis pinnalatus (Quoy & Gaimard).

Seriola bipinnulata Jenyns, Zoology of the voyage of the Beagle, p. 72.

Caranx sexfasciatus (Quoy & Gaimard).

Caranx forsteri Bleeker, Nat. Tijdschr. Ned. Ind. VII, 1854, p. 38.

Family KUHLIIDAE

***Kuhlia taeniura** (Cuvier & Valenciennes). Ikan Samsi.

Eight specimens from 45 to 164 mm. "*Ikan Samsi* occurs in small shoals in the shallow, coral-strewn pools over the inner border of the reef on the seaward side of the islands and in the corresponding areas on the barrier".

Family CHEILODIPTERIDAE

***Apogon auritus** Cuvier & Valenciennes. Ikan Dayang.

Five specimens from 38 to 54 mm. "Fairly common among the branches of stag-horn coral in the shallow areas round Pulo Selma".

Apogon bandanensis Bleeker.

Apogon bandanensis Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 445.

Four specimens from 54 to 60 mm. "This species is found in the upper stratas of the great coral masses, principally the stag-horn, which are filling up large areas of the lagoon".

***Apogon frenatus** Valenciennes.

Two specimens of 73 and 80 mm.

***Apogon melas** Bleeker.

Two specimens of 59 and 62 mm.

***Apogon leptacanthus** Bleeker.

One specimen of 40 mm.

Apogon novemfasciatus Cuvier & Valenciennes.

Apogon novemfasciatus Bleeker, Nat. Tijdschr. Ned. Ind. VII, 1854, p. 38.

Six specimens from 36 to 70 mm. "This fish occurs in the upper layers of the large masses of coral growing up in the centre of the lagoon, usually in the presence of *Madrepora* or *Montipora*".

Other records,

Apogon moluccensis Valenciennes.

Apogon monochrous Bleeker, Nat. Tijdschr. Ned. Ind. XX, 1859–60, p. 142.

Cheilodipterus quinquelineatus.

Cheilodipterus quinquelineatus Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 445.

Family LUTIANIDAE

***Lutianus bohar** (Forskal).

Two specimens of 95 and 135 mm. The notes on the colouration of the smaller fish are interesting. Dr. Gibson-Hill writes: "the flanks are blue-purple, dropping to a light greenish yellow on the belly and a light blue-purple on the throat, with the edges of the scales smoky, giving a reticulated effect. The anterior two thirds of the dorsal and anal fins are a dark smoky grey, and the posterior third white. The caudal fin is smoky at the edges and white at the centre". In the adult the head and body scales are red, edged with smoky grey; the caudal fin is also red with smoky grey edging.

***Lutianus kasmira** (Forskal). Ikan Bordu.

Four specimens from 130 to 150 mm. "*Ikan Bordu* are usually taken outside the lagoon, over the seaward edge of the reef, in water of a depth of three to ten fathoms".

Lutianus monostigma (Cuvier & Valenciennes). Ikan Gĕrisi.

Bleeker (Nat. Tijdschr. Ned. Ind. VII, 1854, p. 38) records *Mesoprion monostigma* Blkr. from the Cocos-Keeling Islands but Weber and de Beaufort (1936) doubtfully synonymise it with the above species.

Four specimens from 100–240 mm. "Occurring in small shoals in the shallow, coral-strewn pools over the inner border of the exposed strip of reef along the seaward side and in the corresponding areas on the barrier. It is very common round Pulo Luar, but less plentiful in other parts of the group".

***Lutianus niger** (Forskal).

One specimen of 170 mm.

Lutianus vaigiensis (Quoy & Gaimard). Ikan Kuning.

Diacope marginata Jenyns, Zoology of the voyage of the Beagle, p. 12.

Three specimens from 110 to 165 mm. "*Ikan Kuning* are very common, in medium-size shoals, in the shallow, sandy, coral-strewn areas on the inside of the barrier and over parts of its outer section".

***Aphareus furcatus** (Lacépède). Ikan Bĕnita.

One specimen of 275 mm. "This fish is a light greyish purple, with the edges of the flank scales greyer and darker. The dorsal fin is a dull olive-grey, the anal yellow, the pectoral slightly pinkish and the caudal dull olive grey with a pink fringe. This fish seems to be found mostly in small shoals near the surface of deepish water, off the edge of the reef between Pulo Panjang and Pulo Luar.

Family NEMIPTERIDAE

Scolopsis cancellatus Cuvier & Valenciennes. Ikan Mata Bĕsar.

Scolopsides cancellatus Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 445.

Four specimens from 138 to 158 mm. "This species is very common in small shoals in the same habitat as *Ikan Janggut Karang*—the shallow, coral-strewn pools over the inner border of the seaward side of the reef and in similar areas on the barrier".

Family LEIOGNATHIDAE

Gerres acinaces Bleeker. Ikan Puteh.

Gerres acinaces Bleeker, Nat. Tijdschr. Ned. Ind. VII, 1854, p. 38.

Three specimens from 158 to 191 mm. "*Ikan Puteh* occurs in the same areas as *Bĕlanak*, inhabiting the weedy, shallow, sandy-bottomed water at the south end of the lagoon, although it is a little less abundant. They may be found in twos or threes, or in large shoals".

Family POMADASYIDAE

***Plectorhynchus chaetodonoides** Lacépède.

One specimen of 43 mm. "This is a single specimen taken from shallow water over a patch of live stag-horn coral near Pulo Selma".

Family LETHRINIDAE

Gnathodentex aurolineatus Lacépède. Ikan Serit Merah.

Pentapus aurolineatus Bleeker, Nat. Tijdschr. Ned. Ind. VII, 1854, p. 354.

Five specimens from 127 to 165 mm. "This species occurs among the coral on the outer border of the barrier or over its edge in slightly deeper water. It is also fairly common in the broad patch of shallow, coral-strewn water to the south of Pulo Luar".

°**Monotaxis grandoculis** (Forskal).

One specimen of 72 mm. "Taken amongst coral on the outer edge of the barrier, near Pulo Bĕras".

°**Lethrinus hypselopterus** Bleeker. (Ikan) Kakap Batu.

Three specimens from 155 to 245 mm. "These are grey on the belly rising to red-grey on the back, with the fins dark red-grey on the rays and red on the webs".

"*Kakap Batu* occur in a somewhat similar habitat to *Kakap* (*Lethrinus leutjanus*), although they may be found in slightly shallower water in the neighbourhood of the barrier".

Lethrinus leutjanus (Lacépède). (Ikan) Kakap.

Lethrinus cocosensis Bleeker, Nat. Tijdschr. Ned. Ind. VII, 1854, p. 38.

Four specimens from 161 to 223 mm. "*Kakap* are a very light greenish grey with several faint horizontal pinkish stripes and the fins slightly reddish. These fish generally occur inside the lagoon on the fringe of large coral patches, at a depth of two fathoms or more".

***Lethrinus microdon** Cuvier & Valenciennes.
(Ikan) Kakap Kuning.

Two specimens of 180 and 293 mm. "In appearance these fish are somewhat similar to *L. leutjanus*—a very light greenish grey, paler, almost white on the belly, with the face grey and the fins slightly reddish—with the addition of a small splash of yellow centred with vermillion at the base of the pectoral fin and behind the gill opening, and with the mouth reddish with yellow tips".

"These fish, like *Kakap*, are found on the edge of coral patches, but they are seldom taken at a depth of less than five fathoms, and outside the lagoon may occur in much deeper water".

***Lethrinus rhodopterus** Bleeker.

One specimen of 177 mm. Similar in habit to *L. hypselopterus*.

Family MULLIDAE

***Upeneus arge**, Jordan & Evermann. Ikan Janggut Buntut.

One specimen of 153 mm. "These fish are off-white, with several light pinkish longitudinal lines along the dorsal surface, and two light yellow bands along the flank. The tail has several short bars, almost spots, on each wing, reddish brown proximally changing to black distally. *Janggut Buntut Bureh* is not plentiful. It occurs in clear, shallow sandy water, mostly off Pulo Luar".

The type locality of this fish is Honolulu, while it has also been recorded from various localities in Polynesia and Micronesia (*see* Fowler 1928, 1933 and Schultz 1943). A record from the Indian Ocean seemed therefore rather surprising. An examination of the museum collections shows, however, that this species had been confused under the closely related *Upeneus vittatus* (Forskal) for there is an undoubted specimen of *arge* from Tahiti and also one from the Seychelles. (Schultz (1943, p. 127) has clearly defined the characters which distinguish *arge* from *vittatus*). These new records from the Seychelles and Cocos-Keeling Islands show that *U. arge* must be a wide ranging Indo-Pacific species.

Mulloidichthys auriflamma (Forskal). Ikan Janggut Kuning.

Upeneus flavolineatus, Jenyns, Zoology of the voyage of the Beagle, p. 24.

Four specimens from 115 to 190 mm.

"This fish is not plentiful. It is found, like *Janggut Buntut Bureh* (*Upeneus arge*), in clean, shallow, sandy water, mostly off Pulo Luar".

*__Mulloidichthys samoensis__ (Günther). Ikan Janggut.

Five specimens from 74 to 215 mm. "*Ikan Janggut* is very plentiful. It occurs in small shoals in the shallow sandy-bottomed pools over the barrier and inside the lagoon".

Parupeneus barberinus (Lacépède). Ikan Janggut Karang.

Upeneus barberinus, Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 445.

Two specimens of 187 and 195 mm. "*Janggut karang* occurs in small shoals in the shallow, coral-strewn pools over the outer portion of the barrier. It is fairly plentiful but by no means as common as *Mulloidichthys samoensis*".

*__Parupeneus bifasciatus__ (Lacépède).

Three specimens from 45 to 130 mm.

*__Parupeneus trifasciatus__ (Lacépède).

Five specimens from 105 to 150 mm.

The Malays call the closely related *P. bifasciatus* and *P. trifasciatus*, *Ikan Janggut Tuan*. They occur "in shallow. pools, fairly rich in coral on the barrier".

*__Parupeneus chryserydros__ (Lacépède).

Ikan Janggut Tuan Kuning.

Five specimens from 195 to 240 mm. "This is a magnificent looking fish running to a length of about 350 mm. In colour it is a fine, pure golden yellow rising to an orange-yellow over the forehead, with about six short, thin blue-purple lines radiating from the eye; the iris crossed by vermillion lines on a background of primrose yellow".

"These fish, which are rather rare, seem to occur only in shallow, coral-strewn pools on the barrier between Pulo Pasir and Pulo Selma".

Family KYPHOSIDAE

Kyphosus cinerascens (Forskal). Ikan Sĕlawai.

Pimelepterus altipinnis, Bleeker, Nat. Tijdschr. Ned. Ind. VII, 1854, p. 38.

Two specimens of 125 and 130 mm. "*Sĕlawai* are found inside the lagoon in fair sized shoals in the same areas as *Minaret*".

Family CHAETODIPTERIDAE

Platax teira (Forskal). Ikan Gubal.

Platax teira Bleeker, Nat. Tijdschr. Ned. Ind. VII, 1854, p. 354.
Platax boersii Ibid.

One specimen of 127 mm. "This species, which is not common, occurs in small shoals in the slightly deeper water, near the centre of the lagoon".

Other records,

Platax orbicularis (Forskal).

Platax vespertilio Bleeker, Nat. Tijdschr. Ned. Ind. XX, 1859-60, p. 142.

Family CHAETODONTIDAE

Anisochaetodon auriga (Forskal).

Chaetodon setifer Jenyns, Zoology of the voyage of the Beagle, p. 61.

Eleven specimens from 64 to 173 mm.

***Anisochaetodon falcula** (Bloch).

Four specimens.

***Anisochaetodon kleini** (Bloch).

One specimen of 83 mm.

Anisochaetodon lineolatus (Cuvier & Valenciennes).

Chaetodon lineolatus Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 169.

Four specimens.

***Anisochaetodon vagabundus** (Linneaus).

Two specimens.

***Anisochaetodon rafflesi** (Bennett).

One specimen of 125 mm.

Chaetodon trifasciatus Mungo Park.

Chaetodon vittatus Bleeker, Nat. Tijdschr. Ned. Ind. XVI, 1858-59, p. 205.

Three specimens.

***Chaetodon lunula** (Lacépède).

One specimen of 48 mm.

Chaetodon ephippium Cuvier & Valenciennes.

Chaetodon ephippium Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 169.

Five specimens.

The foregoing species of butterfly fishes are called by the Malays *Ikan Pĕteh Mĕndĕra*, the last word in the name meaning a flag. "They all have similar habits, occurring in the shallow, coral-strewn pools over the outer and in certain of the middle areas of the barrier. They may also be found in some of the shallower coral patches in the centre of the lagoon. *Pĕteh Mĕndĕra* usually swim in twos or threes".

Chaetodon semeion Bleeker. Ikan Pĕteh Kuning.

Chaetodon semeion Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 445.

Three specimens of ca 145 mm. "Similar in habit to *Pĕteh Mĕndĕra*, but less common".

***Pomacanthus imperator** (Bloch). Ikan Pĕteh Bĕlang.

One specimen of 295 mm. "Occurring in small shoals in the shallow, coral-strewn pools over the outer portion of the barrier".

Division **Cirrhitiformes**

Family CIRRHITIDAE

***Cirrhites pinnulatus** (Bloch Schneider). Ikan Nek Daim.

One specimen of 115. "*Nek Daim* is found inside the lagoon in small shoals, usually in water of a depth of one to three fathoms, in the neighbourhood of coral masses-generally *Karang Piring, Montipora* sp.

***Amblycirrhitus forsteri** (Bloch Schneider).

One specimen of 110 mm. "Caught on a hand line, from a coral patch in deep water inside the lagoon".

***Amblycirrhitus arcatus** (Cuvier & Valenciennes).

Two specimens of 37 and 90 mm.

***Amblycirrhitus hemistictus** (Günther).

Cirrhites hemistictus Günther, J. Mus. Godeffroy Vol. II, 1873–75, (Fische der Sudsee, Heft 11. 1874, p. 69, pl. 50, fig. B).
Cirrhites polystictus Günther, *ibid*, p. 70, pl. 50, fig. A.

One specimen of 142 mm. "This is a single specimen taken in a pool near the outer edge of the barrier in the neighbourhood of Pulo Gangsa. The lower half of the face is a very light olive brown, with an off-black bar in the middle, under the chin. The lower half of the flank is white with a series of close-set, horizontal lemon-yellow stripes. The dorsal half of the fish is olive brown over the head, changing to full olive towards the base of the tail, with off-black spots over the posterior third. There is a horizontal pinkish band in the midline between the two sections. The pectoral fin is golden yellow, and the remainder of the fin a full lemon yellow".

This is a very interesting specimen. In most of the details the colour pattern is that of *Amblycirrhites hemistictus* but it also shows the patch over the lateral line (pale or white in spirit, pink in life) characteristic of *A. polystictus*. (See fig. 1, on Plate 18).[*] In the type specimen of the latter and in the Cocos-Keeling specimen this patch occurs 15 scales from the upper angle of the operculum, counting just above the lateral line.

---

[*] This is much clearer on the right hand side of the specimen from Cocos-Keeling.

This intermediate condition suggested that *hemistictus* and *polystictus* might be but one species, and an examination of the types showed this to be so. A comparison of the type specimens is given below, the figures and counts for *polystictus* being placed in brackets after those of *hemistictus*.

Relative body proportions (in hundredths of standard length).

Length of head 35·5 (34·9); Greatest depth of body 34·2 (32·9). Width of body (measured across base of pectoral fins) 17·4 (17·0); predorsal length 37·7 (37·6); preanal length 64·8 (66·6): length of pectoral 20·0 (20·9); length of pelvic 18·1 (18·2); length of caudal peduncle 21·3 (21·7); depth of caudal peduncle 14·4 (14·3).

Relative head proportions (in hundredths of head length) length of snout 31·8 (33·3); horizontal diameter of eye 15·4 (16·6) interorbital width 14·5 (14·4); postorbital length 57·3 (55·5). *Fin rays* Dorsal X.11 (X.11) Anal III.6 (III.6). Pectoral i.6 + 7 (i.6 + 7); 5th dorsal spine equal to snout, in length. *Gill rakers* 5 + 1 + 12 (5 + 1 + 12) (including rudiments). *Scaling* Lateral line scales (counted just above lateral line) 47 (49). Rows of scales above and below lateral line 5 and 11 (5 and 11). Predorsal scales 16 (15). Rows of scales on cheek 6 (6).

In other respects, (*e.g.* in minute structure of gill rakers and scales) the two are similar. *Amblycirrhites polystictus* (Günther) has therefore been placed under *A. hemistictus* (Günther), the latter having page priority.

I have been unable to determine the sex of the type specimens and of two other specimens (including the one from Cocos-Keeling) in the collections. The significance of the colour phases must await further investigation in the field and museums.

This would appear to be the first record for this species from the Indian Ocean.

Division **Pomacentriformes**

Family POMACENTRIDAE

Dascyllus aruanus (Linnaeus). Ikan Changkĕring.

Dascyllus aruanus Bleeker, Nat. Tijdschr. Ned. Ind. VII, 1854, p. 38.

Eleven specimens from 24 to 46 mm. "*Ikan Changkĕring* are abundant amongst the coral in shallow water, especially the staghorn, occurring equally in the barrier pools and in the upper strata of the coral masses in the centre of the lagoon. Several are usually found to be included wherever a large living piece is brought up for inspection. When swimming freely they generally move singly or in twos or threes, never in large shoals".

***Dascyllus trimaculatus** (Rüppell).

Nine specimens from 68 to 103 mm.

***Chromis caeruleus** (Cuvier & Valenciennes). Ikan Karang.

Twelve specimens from 35 to 44 mm. "This attractive little fish is a light, iridescent green over the upper half, dropping to a very pale silver-blue on the belly, with a bright emerald green stripe from the mouth to the eye. The colour fades quickly out of the water. It is very common in small groups among the living, branched coral in the barrier pools and in the surface of the large coral masses in the centre of the lagoon".

Pomacentrus nigricans (Lacépède).

Pomacentrus taeniops Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 448.

Fifteen specimens from 19 to 71 mm.

Pomacentrus lividus (Bloch, Schneider).

Pomacentrus prosopotaenioides Bleeker, Nat. Tijdschr. Ned. Ind. VII, 1854, p. 38.

One specimen of 47 mm.

The two above species of *Pomacentrus* are known to the Malays as *Ikan (Pĕr) pallau Hitam.*

***Pomacentrus pavo** (Bloch).

Seven specimens from 55 to 70 mm. "In colour it is a light blue-grey, with a series of thin, vertical bright blue-green lines set closely over the whole flank; and a number of fine spots of the same colour at the base of the tail and (slightly bluer) over the head. There is a single, large dark blue-green spot on the operculum. The dorsal and anal fins are a bright ultramarine at the base, rising to black at the fringe. The caudal fin is smoky grey at the base, changing to yellow at the fringe. The pectoral fin is almost transparent, with a faint golden wash".

Abudefduf sordidus (Forskal).

Glyphisodon sordidus Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 170.

Three specimens from 38 to 95 mm.

***Abudefduf septemfasciatus** (Cuvier & Valenciennes).
Ikan (Pĕr) pallau Bĕlang.

Five specimens from 100 to 132 mm. "Common in small shoals in the rock pools along the outer parts of the barrier".

***Abudefduf notatus** (Day).

One specimen of 80 mm. "Taken in a trap, at a depth of three fathoms, near a patch of coral in the north-east corner of the lagoon".

Abudefduf biocellatus (Quoy & Gaimard). Ikan Gemilang.

Glyphisodon biocellatus Bleeker, Nat. Tijdschr. Ned. Ind. VII, 1854, p. 38.
Glyphisodon rossii, *Ibid*, p. 48.
Glyphisodon antjerius, *Ibid* VIII, 1855, p. 446.

Seven specimens from 23 to 40 mm. "These little fish occur in small shoals among living coral in very shallow water, either in the pools or the barrier or in the masses of stag-horn coral near Pulo Selma".

***Abudefduf glaucus** (Cuvier & Valenciennes).
Ikan (Pĕr) pallau Puteh.

Ten specimens from 23 to 72 mm. "*Pallau Puteh* is commen in small shoals in the rock pools along the outer parts of the barrier".

Recently Schultz (1943 p. 179) has considered the above two species to be distinct, while Weber and De Beaufort (1940 p. 436) synonymise *A. glaucus* under *A. biocellatus*. A close examination of the above specimens together with others from the Indian Ocean showed them to be identical in the following characters:— scaling; scale pattern and number; size, number and arrangement of teeth; body proportions; number of gill rakers, pectoral rays and spinous dorsal rays and in relative size of all fins. The one discontinuity in character which Schultz (p. 179) has clearly described, is that of colour. Apparently the only other difference between them is in the number of soft dorsal and anal rays as shown in the table below. The number under each combination of rays refers to the number of specimens examined.

Soft rays	D14 A14	D13 A13	D13 A12	D12 A13	D12 A12	D12 A11	D11 A12
A. biocellatus ..	1	9	4	1	1	..	..
A. glaucus ..	..	1	1	1	11	2	1

It will be seen that there is some intergradation between these characters but it seems clear that a greater series of specimens is required to determine more exactly the degree of overlap. Until this can be done it is premature to decide whether the two are subspecies or species. At present the writer is inclined to leave them as species.

Division **Labriformes**

Family LABRIDAE

Labroides dimidiatus (Cuvier & Valenciennes).

Labroides paradiseus Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 446.

Two specimens of 45 and 53 mm. "Found in pools containing living coral".

***Anampses diadematus** Rüppell. Ikan Barat Ijau.

One specimen of 173 mm. "Taken in a large rock-pool off Pulo Luar".

***Thalassoma hardwicke** (Bennett).

Six specimens from 30 to 155 mm. "This species, which is not common, is occasionally taken over the seaward edge of the barrier at a depth of four fathoms or more".

***Thalassoma güntheri** (Bleeker).
Ikan Sĕlat Lendak Buntut Panjang.

Two specimens of 112 and 130 mm. "These fish which are also found on Christmas Island, occur in the deeper coral-strewn pools over the barrier, and in the upper strata of the coral masses in the centre of the lagoon to a depth of at least three fathoms".

Thalassoma purpureum (Forskal).

Julis souleijettii Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 170.

Two specimens of 148 and 187 mm. length.

The smaller specimen has the colour pattern of *T. umbrostigma* while the larger is typically that of *T. purpureum*. That these two species are identical has been suggested by a number of workers but Waite (1904) from a study of a good series of specimens decided that *T. umbrostigma* was a younger stage of *T. purpureum*. This account did not, however, convince de Beaufort (1940) who prefers to keep the two species separate. Similarly he has kept *T. güntheri* and *T. fuscum* separate, as well as the two above species (although all have been regarded as varieties of one species) because he has never seen specimens with intermediate colour patterns.

I have kept *T. güntheri* as a distinct species but there does seem good reason for uniting *purpureum* and *umbrostigma*. In the museum collections are two specimens from Natal labelled *T. umbrostigma* which are intermediate in colour pattern, showing the spotted markings characteristic of *umbrostigma* on the dorsal surface of the head but over the rest of the head the colour arrangement is that of *T. purpureum*, the bifurcating reddish pigment band running from the eye to the edge of the opercles being particularly evident. An analysis of the sizes of these two series is of further interest. Data from the literature and from museum specimens show that *umbrostigma* ranges from 38 to 254 mm. while *purpureum* ranges from 173 to 431 mm. The relationship may be like that found in the striped wrasse, *Labrus ossifagus*, by Lönnberg and Gustafson (1937) where there are two colour phases red and blue, the former consisting of the young, a few males, but mainly sexually mature females (specimens examined ranged from 111 to 312 mm.), while the latter comprises a few old females and intersexual individuals but mainly older males (specimens ranging from 255 to 345 mm.).

Unfortunately it was not possible to get any definite information about the sex of the larger ranging *purpureum* but of 9 specimens of *umbrostigma* whose sex was determinable, 8 were females and 1 male. There is certainly an interesting problem here which needs combined field and laboratory work. The inter-relations of what have been called *Thalassoma purpureum*, *umbrostigma*, *güntheri* and *fuscum* may well be rather involved, if they all prove to be but one species. It will certainly make the parallel drawn above with *Labrus ossifaga* an over-simplification.

***Thalassoma lunare** (Linnaeus).

Two specimens of 58 and 124 mm.

Hemigymnus melapterus (Bloch).

Tautoga melapterus Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 446.

Two specimens of 110 and 170 mm.

***Stethojulis axillaris** (Quoy and Gaimard).

Five specimens from 56 to 69 mm. "Taken from a mass of staghorn coral, a few feet below the surface of the water, about half a mile west of Pulo Selma (inside the lagoon).

***Stethojulis strigiventer** (Bennett).

Ten specimens from 59 to 73 mm. "These fish occur in small shoals in the shallow pools, with a bottom of sand and coral rock, inside the lagoon or on the inner portions of the barrier. They may also be taken among the large shoals of young *Kakatua* (*Scarus dubius*) which occasionally collect in sandy water".

***Macropharyngodon meleagris** (Cuvier & Valenciennes).

Two specimens of 100 mm.

Halichoeres trimaculatus (Quoy and Gaimard).
Ikan Sĕlat Lendak.

Julis (*Halichoeres*) *spilurus* Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 446.

Eight specimens of 107 to 135 mm. "Found in shallow coral-strewn water along the inner edge of the barrier".

***Halichoeres centiquadrus** (Lacépède). Ikan Barat.

Three specimens of 150, 177 and 185 mm. "This species usually occurs in coral in deeper water, below five fathoms."

***Halichoeres notopsis** (Cuvier & Valenciennes).

One specimen of 47 mm.

***Halichoeres margaritaceus** (Cuvier & Valenciennes).

Six specimens from 27 to 64 mm. "Occurs among the coral in the rock pools over the middle portion of the barrier".

***Cheilio inermis** (Forskal). Ikan Lumut.

One specimen of 254 mm. "Found in weedy sandy water at a depth of about a fathom. It does not collect in shoals".

Gomphosus varius Lacépède.

Gomphosus melanotus Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 446.

One specimen of 109 mm.

***Gomphosus coeruleus** Lacépède.

Two specimens of 155 and 182 mm.

***Hemipteronotus taeniurus** (Lacépède).

Two specimens of 170 and 250 mm.

Cheilinus chlorurus (Bloch). Ikan Lichin.

Cheilinus chlorurus Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 446.

Five specimens from 98 to 160 mm. "Found in weedy water, inside the lagoon at a depth of half to one-and-a-half fathoms".

Cheilinus trilobatus Lacépède. Ikan Ijau Karang.

Cheilinus tetrazona Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 446.

Seven specimens from 120 to 230 mm. "The smaller specimens of this fish can be found in the shallow weedy water towards the south end of the lagoon. The older fish occur in deeper, more corally water".

***Cheilinus fasciatus (Bloch).**

Four specimens from 145 to 190 mm. This species is also called *Ikan Lichin* by the Malays.

***Cheilinus undulatus Rüppell.** Ikan Ijau.

One specimen of 172 mm. This is an immature fish and the notes on colour are of interest. "Off-white on the belly and chin rising to olive green on the dorsal surface, each of the flank scales being smoky grey in its central portion (this colouring is lighter on the ventral surface and darker towards the dorsal). The dorsal, caudal and anal fins are mottled with dark smoky grey on a background of olive green. The cheeks, tips and forehead have orange line markings, broader over the last; there are two horizontal, smoky lines radiating from the eye, the upper crossing the iris. The pelvic fin is a light olive green, and the pectoral very lightly tinged with golden brown".

"This fish occurs in a few of the deeper coral patches near the mouth of the lagoon, and among the coral in the deeper water outside it. It grows to a considerable size, a large specimen reaching a length of some 1600 mm. and a weight of about 115 lbs".

Other records of *Cheilinus* spp.

Cheilinus diagrammus (Lacépède).

Bleeker, Nat. Tijdschr. Ned. Ind. VII, 1854, p. 354.

***Pseudocheilinus hexataenia (Bleeker).** Buntal Lautan.

One specimen of 32 mm.

Epibulus insidiator (Pallas). Ikan Mulut Panjang.

Epibulus insidiator Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 446.

Four specimens from 58 to 180 mm. "This species is found in water of a depth of five fathoms or more over the seaward edge of the barrier. It is not very common.

Family SCARIDAE

***Leptoscarus vaigiensis (Quoy and Gaimard).**
Ikan Kakatua (Bĕr) lumut.

Two specimens. "This fish differs from all the other species of *Kakatua* (parrot fish) occurring in the islands, in that it is found in shallow, weedy, sandy-bottomed water inside the lagoon, and not among the coral on the barrier".

Other records of *Leptoscarus* spp.,

Leptoscarus coeruleopunctatus (Rüppell).

Scarus coeruleopunctatus Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 446.

Scarus harid (Forskal). (Ikan) Kakatua Buntut Panjang.

Scarus mastax Bleeker, Nat. Tijdschr. Ned. Ind. VII, 1854, p. 38.

Two specimens of 220 and 255 mm. "These fish occur in threes or fours in the same habitat as *Kakatua Merah*, the pools along the outer edge of the barrier and the narrow band of broken water immediately beyond it".

***Scarus dubius** Bennett. (Ikan) Kakatua.

Four specimens from 94 to 146 mm. "These fish are very common in the coral-strewn pools along the middle of the barrier and over its outer edge. They also occur, like *Pĕtch Mĕndĕra*, in the shallower coral patches in the centre of the lagoon. They swim usually in twos or threes, but may collect in small shoals. The young fish, about 40–90 mm. long, sometimes congregate in large compact shoals of several thousand, and these may be met well away from the coral, in shallow, sandy-bottomed water".

***Scarus oviceps** Cuvier & Valenciennes. Kakatua Bĕsar.

Two specimens of 145 and 320 mm. "This fish, which is only fairly common, is found in shallow, coral-strewn water inside the lagoon, and over portions of the barrier".

***Scarus forsteri** Cuvier & Valenciennes.

Eight specimens from 57 to 157 mm.

***Scarus rubroviolaceus** Bleeker.

One specimen of 340 mm. "Taken on a line in about two fathoms of water inside the lagoon".

***Scarus viridibusius** (Fowler & Bean).

Two specimens. Somewhat hesitatingly placed under this species, but all the characters agree with those given by Fowler and Bean (1928) in the description of the type.

***Pseudoscarus janthochir** (Bleeker). (Ikan) Kakatua Merah.

Three specimens of 245, 250 and 290 mm. "Occasionally *Kakatua Merah* can be found in coral patches inside the lagoon, but the normal habitat is the pools along the outer edge of the barrier, and the narrow band of broken water immediately beyond it. They are very plentiful".

Pseudoscarus sordidus (Forskal). (Ikan) Kakatua Ijau.

Scarus chlorodon Jenyns, Zoology of the voyage of the Beagle, 1842, p. 105.

Four specimens from 180 to 270 mm. "*Kakatua Ijau* are fairly common. In the water they are probably the most striking of all the coral fish. They swim in small shoals, generally numbering fifteen to twenty and the bright, seried flashes of their bodies as they twist and turn in unison can be seen for a considerable distance. At low water they usually lie just beyond the edge of the barrier, but as the tide rises they follow it into the broad pools which are growing over the inner portion of the barrier flats".

Division **Trachiniformes**

Family PINGUIPEDIDAE

***Parapercis tetracanthus** (Lacépède).

One specimen of 117 mm. "Caught on a hand line from a coral patch in deep water inside the lagoon".

This is apparently the first record of this species from the Indian Ocean.

***Parapercis hexophthalma** (Cuvier & Valenciennes). Ikan Tanah.

Percis hexophthalma Cuvier & Valenciennes, Hist. Nat. Poiss. III, 1829, p. 271.

Percis polyophthalma, *Ibid*, p. 272.

Nine specimens from 119 to 17·7 mm. "Found in shallow, sandy water, usually off the inner edge of the barrier".

Günther (1860, p. 239) synonymised *P. hexophthalma* and *polyophthalma* but later in Playfair and Günther (1866) this decision was reversed on account of the clear cut colour distinctions between the two. They do remark, however, that although they were unable to determine the sexes of their specimens, "one specimen of the *hexophthalma* form is a male, two appear to have been sterile and one of the *polyophthalma* form was probably a female".

Investigation of the Cocos-Keeling fishes together with others in the collection has shown that the *hexophthalma* and *polyophthalma* colour patterns nearly always belong to males and females respectively. Of these specimens showing the typical markings, the following was obtained.

hexophthalma:	Eight specimens from 144 to 185 mm.	All male.
polyophthalma:	Four specimens from 95 to 120 mm.	Female.
	One specimen of 166 mm.	Male.

It will also be seen that the males are larger than the females. There are also a number of specimens "intermediate" in certain respects of colour pattern. These have the first four ocelli along the lower flanks reduced in size to rather diffuse spots of pigment, added to which they may be reduced in number as shown in fig. 2, on Plate 19 (which also shows an associated reduction in the pigment patches situated above the ocelli along the mid flanks). Two "intermediate" specimens from the Red Sea and Fiji have all the characteristics of *polyophthalma* except that the first four ocelli are reduced to small spots of pigment. The former is a female of 133 mm. while the sex of the latter could not be determined. The other intermediate from Cocos-Keeling, which is figured, was first thought to be a male but closer examination of the gonad showed that closely associated with the testicular tissue, and lying posteriorly to it, was a brownish oily mass of tissue in which appeared to be numerous egg cells. If this interpretation is correct (but it must be admitted that the gonad was not too well preserved) it provides yet another instance of intersexuality in teleosts.

In particular the whole series discussed above seems to be quite similar to that found in the Striped Wrasse, *Labrus ossifaga*, by Lonnberg and Gastafson (1937), whose work has already been discussed when drawing similar parallels with the wrasse *Thalassoma purpureum*. But a study of a good series of specimens of *P. hexophthalma* is necessary for elucidating this relationship.

Suborder **Acanthuroidea**

Family ZANCLIDAE

***Zanclus canescens** (Linnaeus).

Two specimens of 52 and 59 mm.

Zanclus cornutus (Linnaeus).

Zanclus cornutus Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 445.

Three specimens of ca. 60 mm.

There seems to be no local name for these two similarly coloured, closely related species. They "occur, at low tide, in the shallow coral pools over the middle and outer portions of the barrier. They usually swim in pairs or threes, and are very difficult to catch".

Family ACANTHURIDAE

***Acanthurus guttatus** Bloch Schneider. Ikan Pĕteh Bureh.

Four specimens from 170 to 187 mm.

Acanthurus triostegus (Linnaeus).

Acanthurus triostegus, Jenyns, Zoology of the Voyage of the Beagle, p. 75.

Six specimens from 29 to 160 mm.

***Acanthurus glaucopareis** (Bloch Schneider).

Two specimens of 147 and 153 mm. There are two colour phases of this species at the Cocos-Keeling Islands. (I can find no significant distinction other than colour between them). The smaller specimen has the typical colour pattern for this species, this being known to the Malays as (*Ikan Hitam*) *Sirit Kuning*. "It is off-black, with a thin yellow line at the base of the dorsal and anal fins, widening posteriorly, a yellow spine at the base of the tail, a pale patch below the eye and a pale ring beneath the mouth. The free border of the pelvic fin is bright purple, and the caudal fin is purplish with a vertical yellow line across it". The other colour phase, which the Malays call (*Ikan Bĕlau*) *Sirit Kuning* and which is represented by the larger specimen, is similar "but with the ground colour over the flanks a deep blue-purple, appearing a rich deep sky-blue in the water. There is also a line of light blue below the mouth. The dorsal fin is yellow, the pelvic brown-yellow at its base, dark blue nearer to the free border and pale blue along it. The caudal fin is purple with a yellow centre".

To judge from the preserved material (in formalin and then in spirit) this colour phase also differs from the more normal in there being no sharp dividing line (at the caudal flexure) between the dark pigmentation of the body and the lighter colours of the caudal fin; instead the two colours gradually merge over the proximal third of the caudal.

Both colour phases would appear to have a similar edging to the dorsal and anal fins (colour in spirit deep brown and then whitish outer most) but it should also be noted that in the second colour phase there is a thin fawn coloured band of uniform thickness along the bases of the dorsal and anal fins.

The ecological notes are quite significant. Of the normal colour phase, Dr. Gibson-Hill remarks: "these fish are mostly found in small shoals, in the shallow water above the larger coral masses rising up in the northern half of the lagoon". The second colour phase "is similar in habits to the preceding, and may occur in shoals with it. It is less plentiful". Clearly this differentiation is worth further investigation.

Acanthurus fuliginosus (Lesson).

Acanthurus matoides Bleeker, Nat. Tijdschr. Ned. Ind. VII, 1854, p. 38.

One specimen of 240 mm.

Zebrasoma velifera (Bloch). Ikan Timbako.

Acanthurus velifer Bleeker, Nat. Tijdschr. Ned. Ind. VII, 1854, p. 38.

Two specimens of 159 and 211 mm. "Common in small shoals in the shallow pools on the barrier, and in the shallower coral-strewn areas inside the lagoon".

***Naso brevirostris** (Cuvier & Valenciennes). Ikan Chula Laut.

Four specimens from 270 to 350 mm. "*Chula Laut* are found outside the lagoon, over the edge of the barrier, at a depth of five to thirteen fathoms".

Naso unicornis (Forskal). Ikan Chula.

One specimen of 225 mm. "*Chula*, which are not very common, are found in the deeper rock pools on the barrier and along its seaward edge".

Suborder **Teuthidoidea**

Family TEUTHIDIDAE

***Teuthis puella** (Schlegel). Minaret Kuning.

Three specimens from 190 to 270 mm.

***Teuthis rostratus** (Cuvier & Valenciennes). Minaret.

Three specimens from 170 to 220 mm. "*Minaret* are abundant in certain shallow, sandy, coral-strewn areas inside the lagoon, particularly over a square mile a little to the south of Pulo Selma. They do not appear to occur outside the lagoon. They generally swim in shoals of a hundred and fifty or more".

Other records,

Teuthis punctatus (Schneider).

Amphacanthus hexagonatus Bleeker, Nat. Tijdschr. Ned. Ind. VII, 1854, p. 38.

Suborder **Gobioidea**

Family ELEOTRIDAE

Asterropterix semipunctatus Rüppell.

Eleotris cyanostigma Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 446.

Nine specimens from 33 to 42 mm. "Found in shallow, weedy, sandy-water inside the lagoon, particularly in the patch to the south of Pulo Selma; fairly plentiful".

Family GOBIIDAE

*__Callogobius hasseltii__ (Bleeker).

One specimen of 19 mm.

Bathygobius fuscus (Rüppell).

Gobius cocosensis Bleeker, Nat. Tijdschr. Ned. Ind. VII, 1854, p. 47.

One specimen of 42 mm.

Acentrogobius cauerensis (Bleeker).

Gobius ophthalmotaenia Bleeker, Nat. Tijdschr. Ned. Ind. VII, 1854, p. 46.

Two specimens of 37 mm. "This species, which is not very common, occurs in shallow rock pools on the outer areas of the barrier, usually fairly near to the high tide level".

*__Acentrogobius puntang__ (Bleeker).

One specimen of 55 mm.

Amblygobius phalaena (Cuvier & Valenciennes).
Ikan Kutu Bĕlanda.

Gobius phalaena Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 446.

Five specimens from 48 to 84 mm. "This species occurs in shallow water, inside the lagoon, where the bottom is muddy and weedy".

*__Paragobiodon echinocephalus__ (Rüppell).

Nine specimens from 9 to 17mm. "This little fish is fairly plentiful among the coral, mostly *Karang Jahe China*, in the pools along the outer portion of the barrier".

Other records,

Gobiodon quinquestrigatus (Cuvier & Valenciennes).

Gobiodon quinquestrigatus Bleeker, Nat. Tijdschr. Ned. Ind. XX, 1859-60, p. 142.

Suborder **Blennioidea**

Family BLENNIIDAE

*__Petroscirtes mitratus__ Rüppell.

Two specimens of 18 and 23 mm.

*__Cirripectus variolosus__ (Cuvier & Valenciennes).
Ikan Gĕladau Hitam.

Five specimens from 31 to 48 mm. Occurs in same habitat as *Istiblennius dussumieri* but it is not very plentiful.

***Istiblennius dussumieri** (Cuvier & Valenciennes).

Ikan Gĕladau (Betŭl).

Thirty specimens from 34 to 90 mm. The males which "have a light pinkish brown comb on the dorsal surface of the head" are known to the Malays as *Ikan Gĕladau Jambul.* "Very common in the small pools round the high tide level, either hiding half under stones or sitting out in the open in small clusters of five or six".

Istiblennius edentulus (Bloch & Schneider).

Salarias quadricornis Jenyns, Zoology of the voyage of the Beagle, 1842, p. 87.

Thirty specimens from 35 to 105 mm. The males of this blenny are called by the Malays *Ikan Gĕladau Hitam* or *Ikan Gĕladau Bĕlang*, the former being distinguished by its darker pigmentation. The females are known as *Ikan Gĕladau Bureh.* They all occur in much the same habitat as the preceding species.

Istiblennius marmoratus (Bennett). Ikan Gĕladau Nyaris.

Salarias arenatus Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 169.

Fifteen specimens from 30 to 58 mm. "*Gĕladau Nyaris* occurs in the same habitat as, and frequently in company with, *Salarias dussumieri*, and is equally plentiful".

***Istiblennius periophthalmus** (Cuvier & Valenciennes).

Fourteen specimens from 50 to 93 mm.

***Istiblennius thalassinus** (Jordan and Seale).

Two specimens of 33 and 40 mm.

***Istiblennius nitidus** (Günther).

Two specimens of 56 and 65 mm.

Other records,

1. **Salarias sumatranus** Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 169.
2. **Salarias hasseltii** Bleeker, Ibid.

Suborder **Mugiloidea**

Family SPHYRAENIDAE

Sphyraena picuda Bloch & Schneider.

One specimen of 217 mm.

Family MUGILIDAE

*__Mugil crenilabis__ (Forskal). (Ikan) Bĕlanak.

Five specimens from 106 to 249 mm. "*Bĕlanak* are abundant in the shallow, sandy-bottomed water at the south end of the lagoon and along the side of Pulo Panjang. They usually swim in shoals of between twenty and a hundred. When frightened they leave the water, rising to a height of one or two feet and covering ten to fifteen feet. Frequently a whole shoal may be seen jumping together".

*__Mugil seheli__ (Forskal). Bĕlanak Bibir Nipis.

Seven specimens from 78 to 321 mm.

*__Mugil waigiensis__ Quoy & Gaimard. (Ikan) Sayap Hitam.

Mugil rossii Bleeker, Nat. Tijdschr. Ned. Ind. VII, 1854, p. 45.

Three specimens from 165 to 195 mm. "These fish occur in the same areas as *Bĕlanak* (*M. crenilabis*)—although they are a little less abundant. They do not jump. They can be found outside the lagoon, over the barrier edge, especially on a low rising tide".

Other records,

Mugil caeruleomaculatus Lacépède.

Mugil caeruleomaculatus Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 446.

Suborder **Polynemoidea**

Family POLYNEMIDAE

*__Polydactylus sexfilis__ (Cuvier & Valenciennes). Ikan Kuror.

Two specimens of 205 and 262 mm. "It occurs in shoals, but only seems to be found in two areas—the shallow slightly weedy water off the north end of Pulo Panjang, and the clear, sandy-bottomed, shallow water on the lagoon side of Pulo Tikus. It is not very plentiful".

Order SCLEROPAREI

Suborder Scorpaenoidea

Family SCORPAENIDAE

Scorpaenodes guamensis (Quoy & Gaimard).

Scorpaena polylepis Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 445.

Two specimens of 52 and 70 mm.

Scorpaenodes keelingensis Nov. sp.[1] (Fig. 3, on Plate 19).

One specimen (Holotype) of 30 mm. (standard length). Locality: Cocos-Keeling Islands, Indian Ocean.

Relative body proportions (expressed in hundredths of the standard length).

Length of head 41·7; greatest depth of body 30·0; predorsal length 40·0; preanal length 73·3; length of pectoral fin 30·0; length of pelvic fin 25·0; length of caudal peduncle 16·7; depth of caudal peduncle 11·7.

Relative head proportions (expressed in hundredths of head length).

Length of snout 28·0; horizontal diameter of eye 32·0; interorbital width 14·0; postorbital length 48·0.

Fin rays. Dorsal XIII, 8 (last ray bifid to basal element) Anal III, 5 (last soft anal ray bifid to base).

Left pectoral 18 (uppermost 3 and lowermost 10 rays unbranched). Longest dorsal spine equal to snout. Second anal spine a little longer than caudal peduncle.

Gill rakers on 1st arch 5 + 1 + 7 (including rudiments). Very short and studded with small 'denticles'.

Scales. Number in transverse rows from origin of dorsal and anal fins to lateral line 5 and 9 respectively. Vertical scale rows above lateral line from upper edge to gill opening to caudal flexure 27 (scales with pores 22, each terminating in a pointed process). Scales ctenoid, those on the head, thorax and abdomen less than half the size of those on the flanks. Head scaled on cheeks, opercles and dorsal surface (as far forward as line between posterior rims of orbits). Base of pectoral (and caudal with covering of small scales); other fins unscaled except for an ill defined sheath at the base of the soft dorsal.

Head spines. 1 nasal (positioned between nares but at rather high level), 2 suborbital, 3 supraocular, 2 postocular (very small), 1 parietal, 1 nuchal (there are smaller rather flattened spines inside (1) and outside (1), the nuchal spine arising fairly close to its base), 1 tympanic, 2 pterotic, 1 posttemporal, 2 opercular, 4 preopercular (the largest in line with the suborbital ridge, 1 considerably smaller above this and 2 smaller below it).

Teeth. A villiform band of teeth along each jaw and a wide V-shaped patch of villiform teeth on the vomer. No teeth on the palatines. Maxillary reaching to below posterior border of eye.

Cirri. Narial: arising from posterior rim of anterior nostril a ribbon like cirrus, conspicuously darker than the rest of the snout, divided into 4 or 5 small fingers terminally and between 2/5 and ½ the diameter of the eye. Supraocular; (1) simple filamentous arising behind the first supraocular spine and 1 darkly pigmented, behind the second supraocular spine divided into numerous small fingers distally (both are rather smaller than the narial cirrus). Suborbital; situated below anterior edge of bulbus, arising from a down going flange of suborbital and divided into 3 fingers distally.

---

[1] Called *keelingensis* rather than *cocosensis* so there need be no confusion with Cocos Island of the Pacific Ocean.

Other smaller, filamentous, darkly pigmented cirri occur on the head, mainly associated with the spines (1 cirrus to each spine). Also arising from the skin immediately adjacent to the cornea are a circle of small dermal projections which are largest dorsally.

Colour (in spirit). Brownish with pale underparts. Detail of colour pattern difficult to discern but there is a light band across the tail, beginning at the end of the bases of the soft dorsal and anal fins and extending halfway along the caudal peduncle. Pelvic and anal fins dusky; pectoral dusky over basal half; caudal with an ineqular barring of dark pigmentation.

This species is most closely related to *Scorpaenodes kelloggi* (Jenkins)* but mainly differs in the following respects:

1. There are only 2 suborbital spines as against 3 in *S. kelloggi*.
2. The position of the preopercular spines. There are 4 in both species but in *S. keelingensis* one of them is found well above the level of the suborbital ridge, while in *S. kelloggi* the most dorsal preopercular spine is on a level with the suborbital ridge.
3. There are 27 vertical scale rows above the lateral line (from the upper edge of the gill opening to the caudal flexure) in *S. keelingensis* and 30 or 31 in *S. kelloggi*.

***Scorpaena tristis** Klunzinger.

One specimen of 54 mm.

Other records of *Scorpaena* sp.,

Scorpaena bandanensis Bleeker.

Scorpaena bandanensis Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 445.

***Pterois volitans** (Linnaeus).

One specimen of 75 mm.

***Pterois radiata** Cuvier & Valenciennes.

Two specimens of 28 and 40 mm.

Family CARACANTHIDAE

***Caracanthus maculatus** (Gray).

Two specimens of 32 and 35 mm. "This species is a very light pinkish grey on the belly, rising to mid-grey on the dorsal surface, with the whole upper two-thirds of the flank and face irregularly speckled with full crimson. The caudal and dorsal fins are mid-grey, the pectoral light grey".

This fish is found amongst the coral, mostly *Karang Jahe China*, in the pools towards the outer portion of the barrier.

Caracanthus unipinna (Gray).

Amphiprionichthys apistus Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 169.

One specimen of 26 mm.

Family SYNANCIIDAE

Synanceia verrucosa Bloch Schneider.

Synanceia brachio Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 169.

One specimen of 205 mm.

Order HETEROSOMATA

Family BOTHIDAE

Bothus pantherinus (Rüppell).

Rhombus sumatranus Bleeker, Nat. Tijdschr. Ned. Ind. VII, 1854, p. 38.

Three specimens from 100 to 115 mm.

Bothus mancus (Broussonet).

Rhombus pavo Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 170.

Two specimens of 194 and 215 mm.

The Malays call these two species (*Ikan*) *Tampah Tampah*. They are "found inside the lagoon in clear, shallow sandy-bottomed water".

Other records,

Engyprosopon cocosensis (Bleeker).

Rhombus cocosensis Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 170.

---

* I am indebted to Dr. Leonard P. Schultz of the Smithsonian Institution for information on this species.

Order PLECTOGNATHI

Family BALISTIDAE

***Sufflamen bursa** (Bloch, Schneider). Ikan Babi Kĕlabu.

Two specimens of 137 and 146 mm. "Found in the coral patches in deeper water inside the lagoon. It is fairly common".

***Sufflamen chrysoptera** (Bloch, Schneider). Ikan Babi Hitam.

One specimen of 200 mm. "Found in groups of three or four amongst the coral in the deeper water in the centre of the lagoon".

Melichthys vidua (Solander).

Balistes vidua Bleeker Nat. Tijdschr. Ned. Ind. VII, 1854, p. 38.

One specimen of 185 mm.

***Odonus niger** (Rüppell).

One specimen of 270 mm. "Taken at a depth of about ten feet in a coral patch inside the lagoon".

***Balistapus capistratus** (Tilesius). Ikan Babi Lautan.

Two specimens of 70 and 240 mm. "These occur only outside the lagoon".

Rhinecanthus aculeatus (Linnaeus).

Balistes aculeatus Bleeker, Nat. Tijdschr. Ned. Ind. VII, 1854, p. 38.

Three specimens of 106 and 175 mm. "These fish are common amongst the coral and coral rock in the shallow water over the barrier. They also occur in the upper stratas of the coral masses in the centre of the lagoon. They never collect in shoals".

***Rhinecanthus rectangulus** (Bloch Schneider).

One specimen of 139 mm.

Family MONACANTHIDAE

Osbeckia scripta (Osbeck).

Alutarius laevis Bleeker, Nat. Tijdschr. Ned. Ind. VII, 1854, p. 355.

Two specimens of 270 and 300 mm.

Family OSTRACIONTIDAE

Ostracion cubicus Linnaeus. Buntal Bĕsagi.

Ostracion cubicus Bleeker, Nat. Tijdschr. Ned. Ind. VII, 1854, p. 38.

Two specimens.

"*Buntul Bĕsagi* are found among the coral in the deepest portions of the lagoon, and in water of eight fathoms or more over the edge of the barrier".

Lactoria cornutus (Linnaeus). Buntal Bĕsagi Bĕrtandok.

Ostracion cornutus Bleeker, Nat. Tijdschr. Ned. Ind. VIII, 1855, p. 446.

One specimen.

"This fish, which is not common, is found in the sandy, slightly weedy water between one and two fathoms in depth towards the south end of the lagoon".

Family TETRAODONTIDAE

***Tetraodon reticularis** Bloch Schneider. Buntal (Bĕtul).

Three specimens of 115, 175 and 195 mm. "Very common amongst the weeds in the shallow, sandy water at the south end of the main lagoon and in the small lagoons on Pulo Panjang".

Family DIODONTIDAE

***Diodon hystrix** Linnaeus. Buntal Landak.

One specimen of 300 mm. "Occurs in the shallow, coral-strewn pools on the barrier, mostly at the south and east sides of the lagoon, where it is fairly common".

Order PEDICULATI

Family ANTENNARIIDAE

Recorded by Bleeker.

Antennarius tuberosus, Bleeker Nat. Tijdschr. Ned. Ind. XV, 1858.

Antennarius horridus, *ibid* XX 1859, p. 142.

Faunal relationships.

Of the 189 species of fish from the Cocos-Keeling Islands dealt with in this paper, 162 or 85·7 per cent are wide ranging Indo-Pacific species, mostly living within what Ekman (1935) has called the tropical Indo-West Pacific area. The remaining 27 species may be divided as follows (according to the records before this collection was studied).

A. Species recorded from the Pacific Ocean only.

Muraenichthys macropterus Bleeker.
Hemirhamphus balinensis Bleeker.
Cypsilurus atrisignis Jenkins.
Epinephelus dämelii (Günther).
Aporops bilinearis Schultz.
Apogon melas Bleeker.

Apogon leptacanthus Bleeker.
Plectorhynchus chaetodonoides Lacépède.
Lethrinus hypselopterus Bleeker.
Mulloidichthys samoensis (Günther).
Anisochaetodon rafflesi (Bennett).
Acanthurus glaucopareis (Bloch-Schneider).
Teuthis puella (Schlegel).
Macropharyngodon meleagris Cuvier & Valenciennes.
Scarus viridibusius Fowler & Bean.
Amblycirrhitus hemistictus (Günther).
Parapercis tetracanthus (Lacépède).
Cirripectus variolosus (Cuvier & Valenciennes).
Istiblennius thalassinus (Jordan & Seale).
Istiblennius nitidus (Günther).

The range of these species may now be extended westwards to the Cocos-Keeling Islands. It should be added that most of them were already known from neighbouring parts of the East Indies.

B. Species recorded from the Pacific and the Cocos-Keeling Islands.

(See under each species for reference).

Chaetodon ephippium Cuvier & Valenciennes.
Chaetodon semeion Bleeker.
Pomacentrus nigricans (Lacépède).
Amblygobius phalaena (Cuvier & Valenciennes).
Melichthys vidua (Salander).

C. Species recorded from the Pacific & Christmas Island (Indian Ocean).

Plesiops melas Bleeker.

See Weber & de Beaufort (1929, pp. 378–379) and Regan (1909, p. 403).

D. Species recorded from the Pacific and the Andaman Islands.

Acentrogobius puntang (Bleeker).

See Koumans, Mem. Ind. Mus. Calcutta 13, 1941, pp. 230–231.

Of these 27 species, further collections and clarification of the systematics may well show that they have a wider distribution, but this is not likely to apply to them all. Most of them are well defined species, not confusible with the nearest related species except perhaps for *Apogon leptacanthus* which is closely related to *A. sangiensis*, *Lethrinus hypselopterus* with *L. mahsena* and *Mulloidichthys samoensis* with *M. auriflamma*.

It seems obvious that the Cocos-Keeling Islands are sufficiently near to the East Indies for there to be a westward overlap of Pacific species. At all events present surface current systems in the ocean do not preclude the possibility of such extension by way of the larvae. It will, however, be best to leave these considerations until these data are more complete.

Bibliography

BRUUN, A. F. 1935. Flying-fishes (Exocoetidae) of the Atlantic. Systematic and biological studies. Dana-Report Copenhagen 6, p. 108.

EKMAN, S. 1935. Tiergeographie des Meeres, p. 327.

FOWLER, H. W. 1928. The fishes of Oceania. *Mem. Bishop Mus.* Honolulu 10, p. 540.

———. 1933. Contributions to the biology of the Philippine Archipelago and adjacent regions. The fishes of the families Banjosidae, Lethrinidae, Sparidae, Girellidae, Kyphosidae, Oplegnathidae, Gerridae, Mullidae, Emmelichthyidae, Sciaenidae, Sillaginidae, Arripidae and Enoplosidae collected by the United States Bureau of Fisheries Steamer "Albatross", chiefly in Philippine Seas and adjacent waters. *Bull. U.S. Nat. Mus.* 100 (Vol. 12), p. 465.

GÜNTHER, A. 1860. Catalogue of the Fishes in the British Museum. Vol. II.

LÖNNBERG, E. and GUSTAFSON, G. 1937. Contributions to the life-history of the Striped Wrasse, *Labrus ossifagus* Lin. *Ark. Zool.* Stockholm, 29A, No. 7, pp. 1–16.

PLAYFAIR, R. L. and GÜNTHER, A. 1866. The fishes of Zanzibar. London, p. 153.

REGAN, C. T. 1909. A Collection of Fishes made by Dr. C. W. Andrews, F.R.S., at Christmas Island. *Proc. Zool. Soc. London*, pp. 403–406.

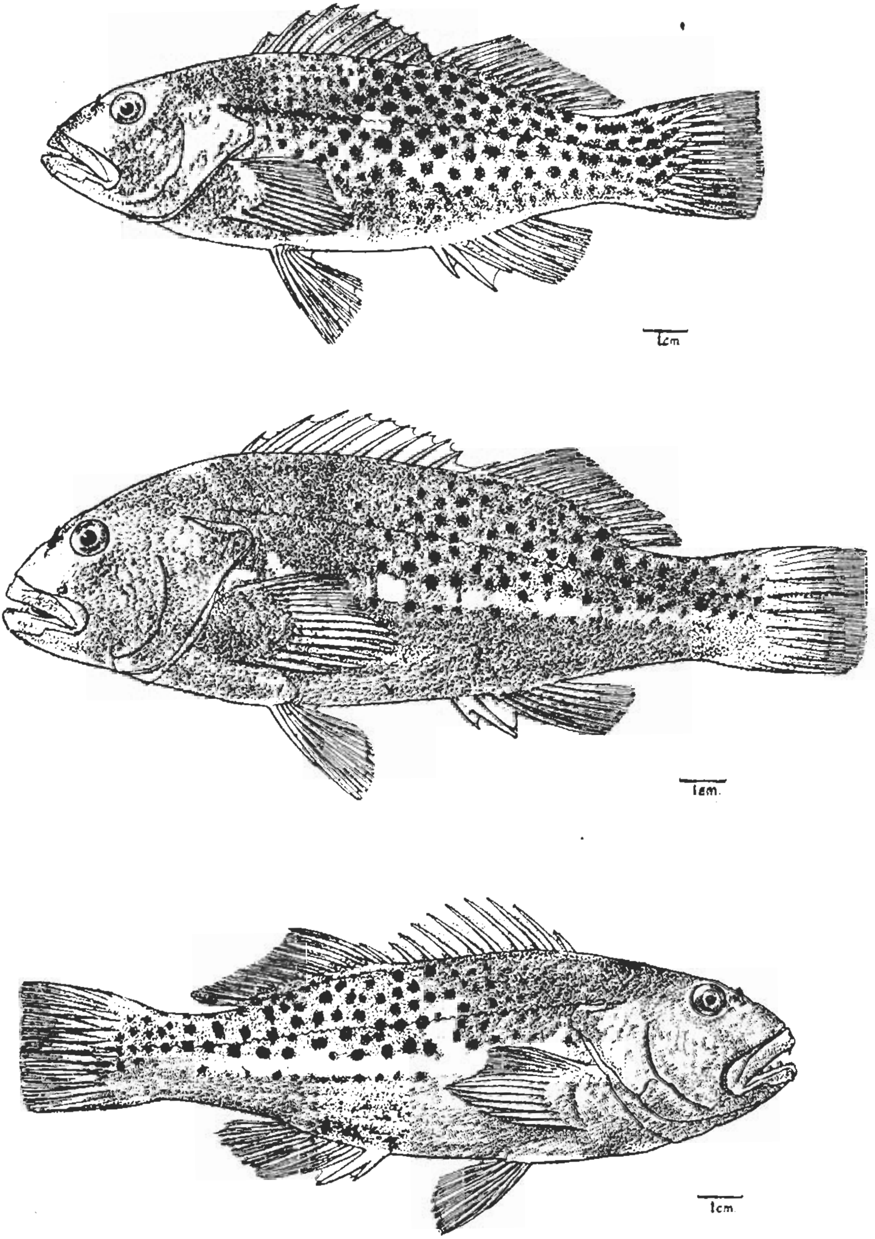
SCHULTZ, L. P. 1943. Fishes of the Phœnix and Samoan Islands collected in 1939 during the expedition of the U.S.S. "Bushnell" *U.S. Nat. Mus. Bulletin*, 180, p. 316.

WAITE, E. R. 1904. Additions to the Fish fauna of Lord Howe Island. No. 4. *Rec. Austral.Mus.*, 5, pp. 135–186.

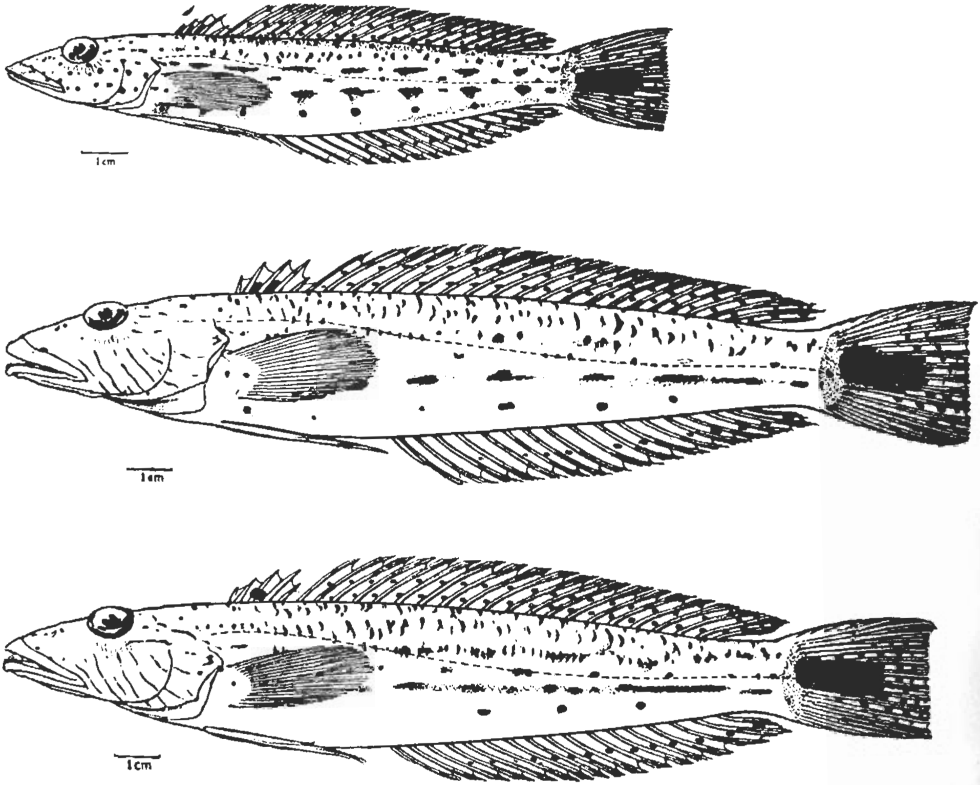
WEBER, M. and DE BEAUFORT, L. F. 1922. The fishes of the Indo-Australian Archipelago. Leiden. 4, xiii + 410 pp.

———. 1929. Ibid. 5, xiv + 458 pp.

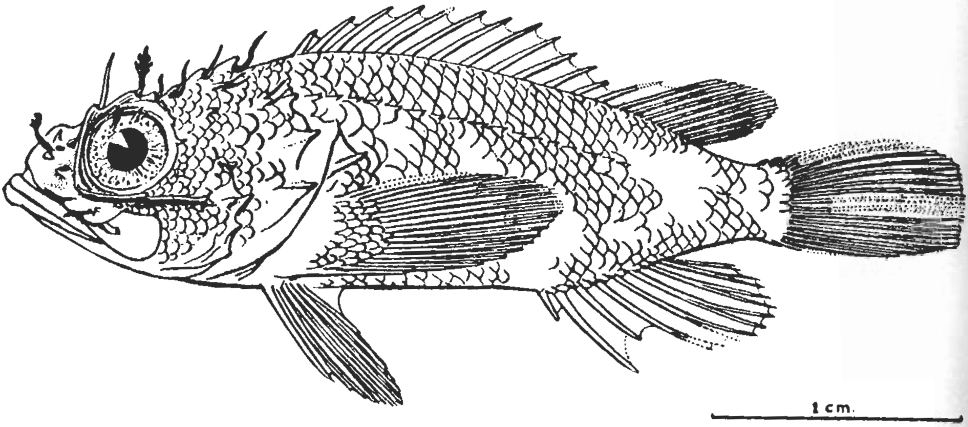
BEAUFORT, L. F. DE. 1940. Ibid. 8, xv + 508 pp.



The Uppermost Figure is that of the type specimen of *Amblycirrhites polystictus* (Günther); the Middle Figure is that of the type specimen of *A. hemistictus* (Günther), while the Lowermost Figure shows the intermediate colouration found in the Cocos-Keeling Islands. (Fig. 1 for N. B. Marshall, Fishes from the Cocos-Keeling Islands).



The Uppermost Figure shows a typical specimen of the so-called *Parapercis polyophthalma* (C.V.); the Middle Figure shows the intermediate colouration found in a specimen from the Cocos-Keeling Islands, while the Lowermost Figure is that of a typical specimen of *P. hexophthalma* (C.V.). (Fig. 2 for N. B. Marshall, Fishes from the Cocos-Keeling Islands).



Scorpaenodes keelingensis sp.n. (Fig. 3 for N. B. Marshall, Fishes from the Cocos-Keeling Islands).